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(54) INJECTION MOLDED FORM WITH FINE PATTERN TRANSFERRED IN HIGH

ACCURACY

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain an injection molded form usable as an optical material with high heat resistance and high moist heat resistance by transferring in high accuracy a fine pattern carved on the inner surface of a mold cavity on a molded form by injection molding.  
SOLUTION: This injection molded form with a fine pattern transferred in high accuracy is obtained by injection molding of a cyclic olefin resin or a thermoplastic resin composition comprising the above cyclic olefin resin and a specific hydrocarbon resin.



## 【特許請求の範囲】

【請求項1】(A)環状オレフィン系熱可塑性樹脂、ま

たは(A)環状オレフィン系熱可塑性樹脂および(B)

ポリスチレン換算重量平均分子量が2000以下で常

温で固体の炭化水素樹脂からなる熱可塑性樹脂組成物を

成形してなる微細なパターンが高精度で転写された射出

成形体。

【請求項2】環状オレフィン系熱可塑性樹脂が1種類以

上の極性基を含有することを特徴とする請求項1に記載

の射出成形体

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、主に光学材料等に

用いられる、表面に微細なパターンが高精度で転写(高

転写)された射出成形体に関し、詳しくは環状オレフ

ン系熱可塑性樹脂または特定の環状オレフィン系熱可

塑性樹脂組成物を使用することにより、耐熱性、耐湿熱性

に優れ、パターンが高精度に転写された射出成形体を提

供するものである。

【0002】

【従来の技術】従来、光学材料の表面に微細なパター

を形成するには、表面を機械的に切削する、レジストを

塗布しパターンを印刷する、熱、紫外線あるいは電子線

硬化型樹脂を用い印刷を行うなどの方法が採用されてい

る。これらの方法は、機械的切削では非常に高度で煩雑

な加工技術が必要となり、パターン印刷法では、工程

が複雑な上に、印刷されたパターンののがれといった耐

久性の問題もあった。これらを、解決する方法として、

金型に微細なパターンを形成し射出成形により転写させ

るものがある。これらには、メタリル樹脂あるいはポ

リカーボネート樹脂などが用いられているが、流動性と

材料固化速度のバランスアップが難しく、高転写する

ことが難しかった。また、これらの樹脂は耐熱性や吸水

による寸法変化の問題があり、光学材料への採用には同

題があった。

【0003】

【発明が解決しようとする課題】本発明は、上記のよう

な課題を背景に成されたもので、その目的は、環状ポリ

オレフィン系熱可塑性樹脂あるいは環状ポリオレフィン

系熱可塑性樹脂組成物の有する諸特性(耐熱性、耐湿熱

性)を保持し、光学材料として使用可能な、表面に微細

なパターンが高精度で転写された射出成形体を提供する。

【0004】

【課題を解決するための手段】本発明は、(A)環状オ

レフィン系熱可塑性樹脂、または(A)環状オレフィン

系熱可塑性樹脂および(B)ポリスチレン換算重量平均

分子量が2000以下で常温で固体の炭化水素樹脂から

なる熱可塑性樹脂組成物を成形してなる微細なパター

ンが高精度で転写された射出成形体を提供するものであ

性樹脂が1種類以上の極性基を含有することを特徴とす

る上記の射出成形体を提供するものである。

【0005】

【発明の実施の形態】以下、本発明の熱可塑性樹脂組成

物について詳細に説明する。

<(A)成分：環状オレフィン系熱可塑性樹脂>本発明

の樹脂組成物を構成する(A)成分：環状オレフィン系

熱可塑性樹脂(以下(A)成分と記す)としては、下記

①〜⑤に示す重合体を挙げることができる。

① 下記一般式(1)で表される単量体(以下、「特定

単量体」という。)の開環重合体

② 特定単量体と共重合性単量体との開環共重合体

③ 前記開環(共)重合体の水素添加重合体

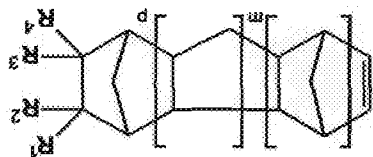
④ 前記開環(共)重合体をフリーラジカル反応に

より環化した後、水素添加した(共)重合体

⑤ 特定単量体と不飽和二重結合含有化合物との酸和共

重合体

【0006】



しはアルキル基である。また、 $n$ は通常0～5であるが、 $n$ の値が小さいものほど、得られる熱可塑性樹脂組成物のガラス転移温度が高くなるので好ましく、さらに $n$ が0である特定単量体は、その合成が容易である点で好ましい。さらに、上記一般式(1)において $R^1$  または $R^2$  がアルキル基であることが好ましく、当該アルキル基の炭素数は1～4であることが好ましく、更に好ましくは1～2、特に好ましくは1である。特に、このアルキル基が上記の式 $-(CH_2)_nCOOR^5$ で表される極性基が結合した炭素原子と同一の炭素原子に結合されていることが好ましい。また、一般式(1)において $m$ が1である特定単量体は、ガラス転移温度の高い熱可塑性樹脂組成物が得られる点で好ましい。

【0000】上記一般式(1)で表わされる特定単量体の具体例としては、次のような化合物が挙げられる。と

シロコ [2.2.1] ヲツト-2-エ、トリシロコ  
[5.2.1.02.6] -8-フセ、チロコ  
[4.4.0.12.6, 17.10] -3-フセ、  
チロコ [6.5.1.13.6, 02.7, 09.13] -4  
-セフセ、セフシロコ [7.4.0.12.5  
19.12.08.13] -3-セフセ、トリシロコ

[4. 4. 0. 12.5] - 3-ウツビシ、5-オキル  
 エシクロ[2. 2. 1]ノブ-2-エシ、5-エチル  
 エシクロ[2. 2. 1]ノブ-2-エシ、5-オキル  
 シカルボニルエシクロ[2. 2. 1]ノブ-2-エ  
 シ、5-オキル、5-オキル、5-オキル

[2. 2. 1] ヲツト-2-エ、5-シツノヒツロ  
[2. 2. 1] ヲツト-2-エ、8-メツキカルホ  
ニルツラツロ [4. 4. 0. 12.5, 17.10] -3  
-ツセ、8-エツキカルホニルツラツロ  
[4. 4. 0. 12.5, 17.10] -3-ツセ、8-  
ノツロホキシカルホニルツラツロ [4. 4. 0.  
12.5, 17.10] -3-ツセ、8-ノツロホキシ  
カルホニルツラツロ [4. 4. 0. 12.5,

17.10] -3- $\kappa$ フェニル-8- $\mu$ -ブトキシカルボニル  
 フトリシクロ[4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3- $\beta$ -  
 フェニル-8- $\mu$ チル-8- $\mu$ チキシカルボニルトリシ  
 クロ[4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3- $\beta$ フェニル  
 8- $\mu$ チル-8- $\mu$ チキシカルボニルトリシクロ

×ナル-8-n-アトキシカルボニルチラシクロ  
 [4. 4. 0. 12.5. 17.10] -3-フチレン, 8-  
 ×ナル-8-17アトキシカルボニルチラシクロ  
 [4. 4. 0. 12.5. 17.10] -3-フチレン, 8-  
 ×ナル-8-n-アトキシカルボニルチラシクロ  
 [4. 4. 0. 12.5. 17.10] -3-フチレン, 8-

[illegible][illegible]

5, 6-ジメチルキシロース [2. 2. 1] ヲ参照せよ  
 -イ、5, 5-ジアセチルキシロース [2. 2. 1] ヲ参照せよ  
 [2. 2. 1] ヲ参照せよ、5, 6-ジアセチル  
 7, 8-ジアセチルキシロース [2. 2. 1] ヲ参照せよ  
 イ、5-ジアセチルキシロース [2. 2. 1] ヲ参照せよ

1]  $\sqrt{7t-2}$ - $\text{E}\sqrt{5}$ , 5, 6- $\text{E}\sqrt{5}$  (7)  $\text{E}\sqrt{5}$  [2. 2.  
 1]  $\sqrt{7t-2}$ - $\text{E}\sqrt{5}$ , 5, 6- $\text{E}\sqrt{5}$  (7)  $\text{E}\sqrt{5}$  [2. 2.  
 1]  $\sqrt{7t-2}$ - $\text{E}\sqrt{5}$ , 5, 6- $\text{E}\sqrt{5}$  (7)  $\text{E}\sqrt{5}$  [2. 2.  
 1]  $\sqrt{7t-2}$ - $\text{E}\sqrt{5}$ , 5, 6- $\text{E}\sqrt{5}$  (7)  $\text{E}\sqrt{5}$  [2. 2.

[2. 2. 1] ヴツ-2-エ、5、5-ヅルク  
-6、6-エ (フルク) エ [2.  
2. 1] ヴツ-2-エ、5、6-ヅルク-5、  
6-エ (フルク) エ [2. 2.  
1] ヴツ-2-エ、5、6-フルク-5  
-フルク (フルク) エ [2. 2. 1] ヴツ-  
2-エ、5-フルク-5-ヅルク

30

[illegible]

—70607070 [4. 4. 0. 12.8.

50  
[17,10] -3- $\pi$ -8- $\pi$  [4,4,0,12,5,17,10] -3- $\pi$   
[4,4,0,12,5,17,10] -3- $\pi$ -8- $\pi$  [4,4,0,12,5,17,10] -3-

2.5, 19.12, 08.13] -3-ヘプタセンは、最終的に得られる熱可塑性樹脂組成物が耐熱性に優れたものと  
なる点で好ましく、特に、8-メチル-8-メトキシカ  
ルボニルチトラシロ[4.4.0.12.5.17.10]  
-3-ブテンは、(B)成分との相溶性に優れた環境  
ポリオレフィンを素樹脂が得られることから好ましい。

【0011】＜共重合性単量体＞（A）成分を得るための開環重合工程においては、上記の特定単量体を単独で開環重合させてもよいが、当該特定単量体と共重合性単量体とを開環共重合させてもよい。この場合、使用される共重合性単量体の具体例としては、シクロブテン、シクロペンテン、シクロヘキセン、シクロオクテン、トリシクロ[5.2.1.0<sup>2,6</sup>]-3-チレン、5-エチリチン-2-ノルボルネン、シクロペンタジエンなど、シクロオレフィンを挙げることができる。シクロオレフィンの炭素数としては、4～20が好ましく、さらに好ましくは5～12である。更にポリプロピレン、ポリイソブレン、スチレン-プロピレン共重合体、エチレン-非共役ジエン共重合体、ポリノルボルネンなどの主鎖に炭素-炭素間二重結合を含む不飽和炭化水素系ポリマーなどの存在下に特定単量体を開環重合させてもよい。そして、この場合に得られる開環重合体の水素添加物は、耐腐蝕性の大きい樹脂の原料として有用である。

【0012】＜開環重合触媒＞本発明において、開環重合反応は、(a) W、MoおよびReの化合物から選ばれた少なくとも1種と、(b) フェニルの周期律表I A族元素（例えばLi、Na、Kなど）、II A族元素（例えばMg、Caなど）、II B族元素（例えばZn、Cd、Hgなど）、III B族元素（例えばB、Alなど）、IV A族元素（例えばTi、Zrなど）あるいはIV B族元素（例えばSi、Sn、Pbなど）の化合物であって、少なくとも1つの当該元素—炭素結合あるいは当該元素—水素結合を有するものから選ばれた少なくとも1種との組合せからなる触媒である。またこの場合に触媒の活性を高めるために、後述の添加剤(c)が添加されることがある。

【0013】(a)成分として適当なW、M<sub>0</sub>あるいはR<sub>0</sub>の化合物の代表例としては、WC<sub>16</sub>、M<sub>0</sub>C<sub>1</sub>、R<sub>0</sub>、R<sub>0</sub>OC<sub>10</sub>、など特開平1-240517号公報に記載の化合物を挙げることができる。(b)成分の具体例としては、n-C<sub>8</sub>H<sub>9</sub>Li<sub>1</sub>、(C<sub>2</sub>H<sub>5</sub>)<sub>3</sub>Al<sub>1</sub>、(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>AlCl<sub>1</sub>、(C<sub>2</sub>H<sub>5</sub>)<sub>1.5</sub>AlCl<sub>1</sub>、(C<sub>2</sub>H<sub>5</sub>)<sub>1.5</sub>AlCl<sub>1.5</sub>、(C<sub>2</sub>H<sub>5</sub>)<sub>1.5</sub>AlCl<sub>1.5</sub>、メチルアルキルシラン、LiHなど特開平1-240517号公報に記載の化合物を挙げることができる。添加剤である(c)成分の代表例としては、アルコール類、アルデヒド類、ケトン類、アミン類などが好適に用いることができるが、更に特開平1-240517号公報に示される化合物を使用することができる。

7.10] -3- $\kappa$ フェン、ベンゾシクロ[7.4.0.1  
ン、8-エチルチオラシクロ[4.4.0.1<sup>2,5</sup>. 1  
シクロ[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェ  
2.5. 17.10]-3- $\kappa$ フェン、8-エチルチオラ  
8-メトキシカルボニルチオラシクロ[4.4.0.1  
【0010】これらの特定異量体のうち、8-メチル  
17.10]-3- $\kappa$ フェンなどを導くことができる。  
キシカルボニル)チオラシクロ[4.4.0.1<sup>2,5</sup>.  
ン、8-メチル-8-(2,2,2-トリフルオロエト  
ラシクロ[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェ  
(2,2,2-トリフルオロエトキシカルボニル)チ  
[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、8-  
8,9-ビス(トリフルオロメチル)チオラシクロ  
12.5. 17.10]-3- $\kappa$ フェン、8,9-ジクロロ-  
8,9,9-トリフルオロチオラシクロ[4.4.0.  
0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、8-クロロ-  
ビル-9-トリフルオロメチルチオラシクロ[4.4.  
8,9-ジフルオロ-8-ヘプタフルオロイソ-7  
ロ[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、  
チル-9,9-ビス(トリフルオロメチル)チオラシク  
-3- $\kappa$ フェン、8-フルオロ-8-ペンタフルオロエ  
ロキキシチオラシクロ[4.4.0.1<sup>2,5</sup>. 17.10]  
ン、8,9-トリフルオロ-9-ペンタフルオロブ  
ラシクロ[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェ  
8,9-トリフルオロ-9-トリフルオロメチル  
[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、8,  
リフルオロ-9-トリフルオロメチルチオラシクロ  
0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、8,8,9-トリ  
-ビス(トリフルオロメチル)チオラシクロ[4.4.  
17.10]-3- $\kappa$ フェン、8,9-ジフルオロ-8,9  
ロメチル)チオラシクロ[4.4.0.1<sup>2,5</sup>.  
セン、8,8-ジフルオロ-9,9-ビス(トリフル  
トラシクロ[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フ  
8,8,9,9-テトラキス(トリフルオロメチル)チ  
クロ[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、  
- $\kappa$ フェン、8,8,9,9-テトラフルオロチオラシ  
ル)チオラシクロ[4.4.0.1<sup>2,5</sup>. 17.10]-3-  
3- $\kappa$ フェン、8,8,9-トリリス(トリフルオロメチ  
ルオロチオラシクロ[4.4.0.1<sup>2,5</sup>. 17.10]-  
12.5. 17.10]-3- $\kappa$ フェン、8,8,9-トリフ  
-8-トリフルオロメチルチオラシクロ[4.4.0.  
4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、8-メチル  
9-ビス(トリフルオロメチル)チオラシクロ[4.  
[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、8,  
8,8-ビス(トリフルオロメチル)チオラシクロ  
ロ[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、  
7.10]-3- $\kappa$ フェン、8,9-ジフルオロチオラシク  
8-ジフルオロチオラシクロ[4.4.0.1<sup>2,5</sup>. 1  
[4.4.0.1<sup>2,5</sup>. 17.10]-3- $\kappa$ フェン、8,  
 $\kappa$ フェン、8-ペンタフルオロエチルチオラシクロ

【0014】××××××の使用量としては、上記

(a) 成分と特定単量体とのモル比で「(a) 成分：特定単量体」が、通常 1:500~1:50000 となる範囲、好ましくは 1:1000~1:10000 となる範囲とされる。(a) 成分と (b) 成分との割合は、金風原子比で「(a) : (b)」が 1:1~1:50、好ましくは 1:2~1:30 の範囲とされる。(a) 成分と (c) 成分との割合は、モル比で「(c) : (a)」が 0.005:1~1:5、好ましくは 0.05:1

~7: 101 圖表 242。

【0015】〈分子量調節剤〉開環重合体の分子量の調節は重合温度、触媒の種類、溶媒の種類によっても行うことができるが、本発明においては、分子量調節剤を反応系に共存させることにより調節することが好ましい。ここに、好適な分子量調節剤としては、例えばエチレン、プロペン、1-ブテン、1-ペンテン、1-ヘキセン、1-ヘプテン、1-オクテン、1-ノネン、1-デセンなどのα-オレフィン類およびスチレンを挙げることもでき、これらのうち、1-ブテン、1-ヘキセンが特に好ましい。これらの分子量調節剤は、単独であるいは2種以上を混合して用いることができる。分子量調節剤の使用量としては、開環重合反応に供される特定単量体1モルに対して0.005~0.6モル、好ましくは0.02~0.5モルとされる。

【0016】＜開環重合反応用溶媒＞開環重合反応において用いられる溶媒（特定単量体、メタセシス酸および分子重量調節剤を溶解する溶媒）としては、例えばベンゼン、ヘキサン、ヘプタン、オクタン、ノナン、デカンなどのアルカン類；シクロヘキサン、シクロヘプタン、シクロオクタン、デカリン、ノボルンなどのシクロ

アルカリ類：ペンゼン、トルエン、キシレン、エチルペンゼン、クメンなどの芳香族炭化水素；クロロタン、クロム酸、塩化メチレン、ジクロロエタン、ヘキサメチレンジブロミド、クロロベンゼン、クロホルム、トリクロロエチレンなどのハロゲン化アルカン；アミン類などの化合物；酢酸エチル、酢酸ノルマル、アクリルなどの化合物；

酢酸：s-0-アチル、p-ロビオン酸メチル、ジメチキシンエタンなどの酸和カルホル酸エステル類；ジブチルエーテル、ブチラセトクロラソ、ジメチキシンなどのエーテル類を挙げることができる。これは単独であるいは混合して用いることができる。これらのうち、芳香族炭化水素が好ましい。溶媒の使用量としては、「溶媒：特定単量体（重量比）」が、通常1：1～10：1となる量とされ、好ましくは1：1～5：1となる量とされ

【0017】＜水素添加触媒＞以上のようにして得られ  
る。開環（共）重合体は、そのまま（A）成分として使用  
することもできるが、水素添加された水素添加（共）重  
合体を（A）成分として使用することが好ましい。水素  
添加反応は、通常の反応方法、すなわち、開環（共）重合体





は、金型の可動側、固定側、あるいは双方側に形成されていても良く、スライコフなど可動部を伴う構造でも良い。

【0032】ゲート形状は、ストリート形状、ピソングート、フソングート、フイルムゲート、トソネルゲート、ゲート途中に絞りを入れたものなど公知の方法が使用できる。成形品の突き出しは、ピン突き出し、面付きだしなど公知の方法が使用できる。金型の温調用媒体としては通常の水あるいは鉱油などを使用できる。成形以前

の樹脂の乾燥は公知の熱風式、除湿式あるいは真空式で通常80℃～120℃で4～6時間行われる。また、成形品の色相改良あるいは焼け防止の観点から、ホッパ一部より塗薬、アルコフなど不活性ガスの封入や、例えば住友重機械工業（株）から上市されている「ALFI

N」などの様に可塑化部を真空にする装置を使用しても良い。成形条件は特に規定されないが、通常シリソング温度が260℃～300℃、金型温度は、環状オレフィン系樹脂または特定の環状オレフィン系樹脂組成物のガラス転移温度T<sub>g</sub>－1℃～T<sub>g</sub>－20℃の範囲で成形することが好ましい。

【0033】本発明の射出成形体を用い、フリスム、レスス、平面レスス、回折格子、液晶ディスプレイ装置の導光板、拡散板、各種ライトガイドなど、表面に微細なパターン加工が必要な各種光学材料に使用することができ。

【0034】

【実施例】以下、本発明の実施例について説明するが、本発明がこれらによって制限されるものではない。なお、以下において「部」は「重量部」を示す。

【0035】A成分

本発明のプロトタイプ導光板に用いるA成分の一覧を表1に示した。A成分の調製法として(A-1)成分の合成方法を例示する。なお、(A-2)以下は(A-1)に準じて製造した。

【0036】

【表1】

ートあるいはフイルムを積層する。顔料あるいは染料を含む塗料を塗布するなどが挙げられる。なお、フイルムシートを積層する場合にはその表面に公知の表面処理が施されていても良い。

【0029】本発明の成形体の形状は特に限定されない。形状の例としては、円形あるいは多角形状の平板、板、棒状、中空円、フリスム、レスス、櫛状などが挙げられる。また微細なパターン形状も特に限定されない。

10 例え、成形体表面に平行あるいは格子状の溝（凹型、凸型、V型、半円型、台形型、フリスム型）が一本あるいは複数本ある形状。半球、三角錐、四角錐などの多角錐、円錐、直方体、円柱、三角柱、四角柱などの多角柱などが、格子状あるいは千鳥状に複数配列された形状。成形体表面に、円、十字、多角形、角状多角形などのテーキンが施された形状などが挙げられる。微細な

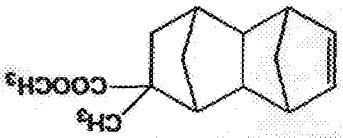
パターン例を図1～10に示した。

【0030】微細なパターンの大きさは特に限定されないが、好ましくは深さ、幅が0.01～1000μmのものを書きさせることが可能であり、好適には0.01～500μm、さらに0.01～100μm、特に0.02μm、さらに好ましくは200～0.02μm、特に好ましくは100～0.05μmのものが適用できる。

【0031】本発明の成形体は射出成形により成形される。射出成形機は特に限定されない。例え、シリソング方式として、インソング式、フリスム式、型鋳め方式として直圧式、トソル式、型鋳め方式として、油圧式、電動サーボ方式、これらが組み合わさった方式などが挙げられる。また、微細なパターンは、金型で付与されるが、金型は通常公知の鋼材により製造される。また、公知の方法でキヤビティ一面に表面処理されていても良い。また金型の微細なパターンは、公知の切削、エッチング、電鍍などの方法により形成される。微細なパター



(A-1)	樹脂	8-メチル-8-メチル-5-ジニルチラジ	250	[ $\eta$ ] [4.4, 0.15] 1	-3- $\beta$ - $\gamma$ - $\delta$ - $\epsilon$ - $\zeta$ - $\eta$ - $\theta$ - $\iota$ - $\kappa$ - $\lambda$ - $\mu$ - $\nu$ - $\xi$ - $\omicron$ - $\pi$ - $\rho$ - $\sigma$ - $\tau$ - $\upsilon$ - $\phi$ - $\chi$ - $\psi$ - $\omega$ - $\alpha$ - $\beta$ - $\gamma$ - $\delta$ - $\epsilon$ - $\zeta$ - $\eta$ - $\theta$ - $\iota$ - $\kappa$ - $\lambda$ - $\mu$ - $\nu$ - $\xi$ - $\omicron$ - $\pi$ - $\rho$ - $\sigma$ - $\tau$ - $\upsilon$ - $\phi$ - $\chi$ - $\psi$ - $\omega$ - $\alpha$ - $\beta$ - $\gamma$ - $\delta$ - $\epsilon$ - $\zeta$ - $\eta$ - $\theta$ - $\iota$ - $\kappa$ - $\lambda$ - $\mu$ - $\nu$ - $\xi$ - $\omicron$ - $\pi$ - $\rho$ - $\sigma$ - $\tau$ - $\upsilon$ - $\phi$ - $\chi$ - $\psi$ - $\omega$ - $\alpha$ - $\beta$ - $\gamma$ - $\delta$ - $\epsilon$ - $\zeta$ - $\eta$ - $\theta$ - $\iota$ - $\kappa$ - $\lambda$ - $\mu$ - $\nu$ - $\xi$ - $\omicron$ - $\pi$ - $\rho$ - $\sigma$ - $\tau$ - $\upsilon$ - $\phi$ - $\chi$ - 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【0039】このようにして得られた開環重合体溶液4  
000部をオートクレーブに仕込み、この開環重合体溶  
液に、RuHCl(CO) [P(C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>]<sub>2</sub>、  
0.48部を添加し、水素ガス圧100k<sub>g</sub>/cm<sup>2</sup>、  
反応温度165℃の条件下で3時間加熱撹拌することに  
より水素添加反応させた。得られた反応溶液（水素添加  
重合体溶液）を冷却した後、水素ガスを放圧した。この  
ようにして得られた水素添加重合体（以下、(A-1)  
成分という。）の水素化率は実質上100%である。  
【0040】  
【B成分】(B-1)成分  
シクロペンタジエン-ビニル芳香族系石油樹脂 分子量  
1130、軟化点125℃  
(B-2)成分  
ビニル芳香族系石油樹脂 分子量2440、軟化点14  
50 0℃

【0037】(A-1)成分の調整方法  
下式(1)で表される8-メチル-8-メチル-5-ジニルチラジ  
ポニルチラジロ[4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-  
3-プロピレン(特定単量体)250部と、1-ヘキセン  
(分子量調節剤)41部と、トルエン(開環重合反応用  
溶媒)750部とを窒素置換した反応容器内に仕込み、  
この溶液を60℃に加熱した。次いで、反応容器内の溶  
液に、トリエチルアルミニウムのトルエン溶液(1.5  
モル/1)0.62部と、1-ブチノール/メチノール  
で変性した六塩化タングステン(1-ブチノール:メチ  
ノール:タングステン=0.35モル:0.35モル:1  
モル)のトルエン溶液(濃度0.05モル/1)3.7  
部とを添加し、この系を80℃で3時間加熱撹拌するこ  
とにより開環重合反応させて開環重合体溶液を得た。こ  
の重合反応における重合化率は97%であった。  
【0038】  
【化2】

- ・形状-5  
1片の長さが15mm、高さが15mmの直角二等片三角柱状のフ  
リムスの正方形となる面に、幅1mm、深さ1mm、直径15  
μmのマークを形成した。  
【0044】試験片の成形方法  
下記の試験で使用するサンプルを射出成形にて行った。  
成形機は住友重機製SG75M-2。成形条件は、樹脂温度260  
〜300℃、金型温度80〜140℃。  
【0045】本発明の趣旨に従い下記の項目について試  
験を行った。  
※転写性  
微細な転写性を微細形状測定器で測定し、下記の如く形  
状別に評価を行った。  
・形状-1  
◎-深さ方向の直線部転写性が95%以上  
○-深さ方向の直線部転写性が85%〜95%  
△-深さ方向の直線部転写性が70%〜85%  
×-深さ方向の直線部転写性が70%未満  
・形状-2  
◎-直線部短辺側の転写性が90%以上  
○-直線部短辺側の転写性が80%〜90%  
△-直線部短辺側の転写性が70%〜80%  
×-直線部短辺側の転写性が70%未満  
・形状-3  
◎-半球状フットの最長径部における真円度が98%以  
上  
○-半球状フットの最長径部における真円度が95〜9  
8%  
△-半球状フットの最長径部における真円度が85〜9  
5%  
×-半球状フットの最長径部における真円度が85%未  
満  
・形状-4  
◎-V溝両辺の平均の転写性が90%以上  
○-V溝両辺の平均の転写性が80〜90%  
△-V溝両辺の平均の転写性が70〜80%  
×-V溝両辺の平均の転写性が70%未満  
・形状-5  
○-マークのずれがなく充分に転写されている。  
△-マークの一部にずれが見られる。  
×-マークの多重転写が見られる。  
【0046】※耐久性  
次の2種類の試験を行い、試験後のパターン形状を評価  
した。  
・耐熱性  
ギアオーブン、100℃×500時間放置  
・耐湿熱  
高温恒湿槽、85℃×85RH%中に500時間放置  
試験後のサンプルの形状を上記のそれぞれの評価基準に  
準じて評価した。

- (B-3) 成分  
C9/シタロペンタジエン系石油樹脂 分子量81  
8、軟化点125℃  
(B-4) 成分  
水添C9系石油樹脂 分子量1590、軟化点100℃  
その他樹脂  
メタクリル樹脂：比重1.19、Tg108℃、MFR  
(260℃、10Kg) 154  
ポリカーボネート樹脂：比重1.20、Tg146℃、  
MFR (260℃、10Kg) 34  
【0041】熱可塑性樹脂組成物の調整法  
A成分の重合溶液に所定量のB成分を添加・溶解後、大  
量のポリマー溶液で澱固・ポリマーを単離した後造粒  
し、ペレットを得た。ポリマーの粘度比は、コーソフレ  
ート型レオメーターにて、260℃における、せん断速  
度-溶解粘度の関係を、公知のレオロジーモデル (cross  
モデル) に基づき解析し、せん断速度10 (rad/s) の溶  
融粘度η1とせん断速度10000 (rad/s) の溶解粘度  
η2を求め、粘度比η1/η2を算出した。実施例およ  
び比較例に使用したポリマーあるいは組成物の粘度比η  
1/η2を表-2に示した。  
【0042】  
【表2】  

η1/η2	(A-1)	(A-3)	(A-5)	(A-7)	メタクリル樹脂	ポリカーボネート樹脂
300	280	220	230	250	100	40
320						
330						
350						
320						
(A-2)(B-1)=100.55						
(A-4)(B-2)=100.20						
(A-6)(B-3)=100.20						
(A-8)(B-4)=100.20						
300						

【0047】実施例1～24、比較例1～10

\*に、耐熱性、耐湿熱性に優れるので、実使用の環境下で  
パターンの形状が変化することもないことがわかる。

表-3～表-5に示す組成により射出成形体の性能評価  
を行った。これらの比較より、本発明の射出成形体は、

成形体表面の微細なパターンの転写性に優れることも \*

【表3】

成分	1	2	3	4	5	6	7	8	9	10	11	12
A-1	100	100	100	100	100							
A-2						100						
A-3							100					
A-4								100				
A-5									100	100	100	100
A-6												
A-7												
A-8												
A-9												
成分												
B-1												
B-2												
B-3												
B-4												
その成分												
メタクリル樹脂												
UVB-291樹脂												
硬化剤												
顔料												
耐熱性												
耐湿熱性												

【0048】

\* 【表4】

成分	1	2	3	4	5	6	7	8	9	10	11	12
A-1	100											
A-2		100										
A-3			100									
A-4				100								
A-5					100							
A-6						100						
A-7							100					
A-8								100				
A-9									100			
成分												
B-1												
B-2												
B-3												
B-4												
その成分												
メタクリル樹脂												
UVB-291樹脂												
硬化剤												
顔料												
耐熱性												
耐湿熱性												

\* 【表5】

【0050】

【0049】

比較例									
A成分	1	2	3	4	5	6	7	8	10
A-1									
A-2									
A-3									
A-4									
A-5									
A-6									
A-7									
A-8									
B成分									
B-1									
B-2									
B-3									
B-4									
その他成分									
メタリル樹脂	100	100	100	100	100	100	100	100	100
エポキシ樹脂	1	2	3	4	5	1	2	3	4
硬化剤	○	△	△	△	○	△	△	△	△
耐久性									
耐熱性	△	△	△	△	△	△	△	△	△
耐湿性	×	×	×	×	×	×	×	×	×

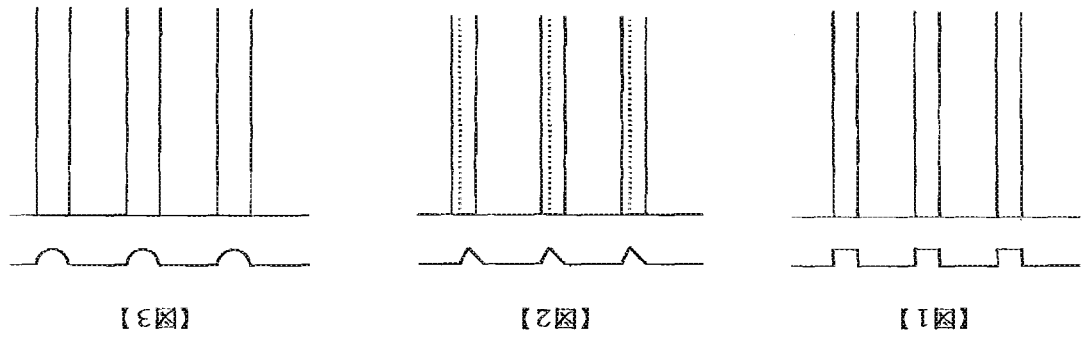
【0051】

【発明の効果】本発明の熱可塑性樹脂組成物は、環状ポリオレフィン系樹脂の好ましい特性（耐熱性、耐湿熱性）を保持しながら、表面に微細なバターンを転写した射出成形体を提供することができる。

【0052】

【図面の簡単な説明】

【図1】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図2】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図3】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図4】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
\* 体の例を示す模式図それぞれ平面図と断面図を示す



【図1】

【図2】

【図3】

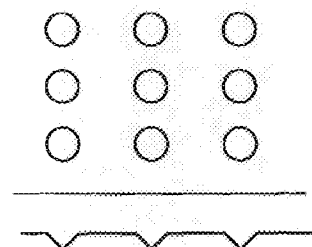
\* 【図5】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図6】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図7】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図8】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図9】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
【図10】 本発明の微細なバターンを転写した射出成形体の例を示す模式図それぞれ平面図と断面図を示す  
30 【符号の説明】  
点線は、突起部の稜線もしくは溝の底辺を示す

(72) 発明者 牛野 卓浩

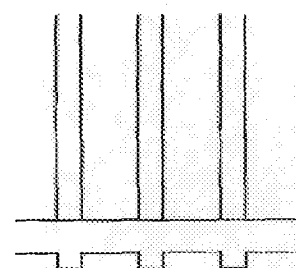
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エスアール株式会社内

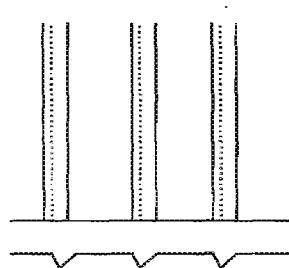
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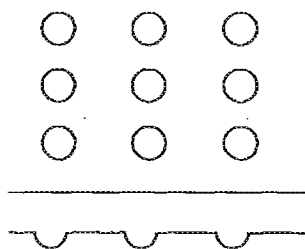
【図10】



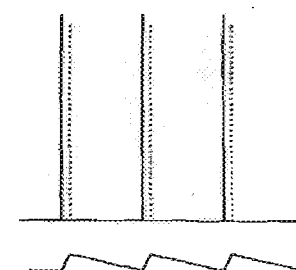
【図7】



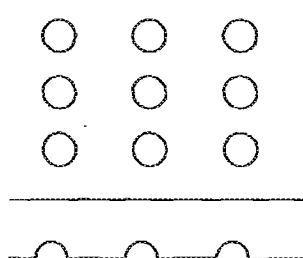
【図8】



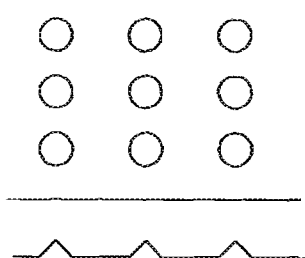
【図9】



【図4】



【図5】



【図6】

## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] In this invention, the pattern detailed on the surface mainly used for an optical material etc. uses cyclic olefin system thermoplastics or a specific cyclic olefin system thermoplastic resin composition in detail about the injection-molding object transferred with high degree of accuracy (high transfer).

Therefore, it excels in heat resistance and resistance to moist heat, and the injection-molding object in which the pattern was transferred with high precision is provided.

[0002]

[Description of the Prior Art] In order to form a detailed pattern in the surface of an optical pattern, are adopted. Dramatically, at the altitude, these methods needed complicated beam hardening resin which applies the resist which cuts the surface mechanically and prints material conventionally, methods, such as printing using the heat, ultraviolet rays, or electron processing technology, and by the pattern printing method, a process is complicated and also they also had the problem of endurance called peeling of the printed pattern at mechanical cutting. There is a thing which forms a detailed pattern in a metallic mold as a method of solving these, and is made to transfer by injection molding. Although methacrylic resin or polycarbonate resin was used for these, balance matching of mobility and a material solidification speed was bad, and it was difficult to high-transfer. These resin had a problem of the dimensional change by heat resistance or water absorption, and there was a problem in adoption to an optical material.

[0003]

[Problem(s) to be Solved by the Invention] Accomplished this invention against the background of the above technical problems, and the purpose, The various characteristics (heat

resistance, resistance to moist heat) which cyclic polyolefin system thermoplastics or a cyclic polyolefin system thermoplastic resin composition has are held, and a pattern detailed on the surface usable as an optical material provides the high-transferred injection-molding object.

[0004]

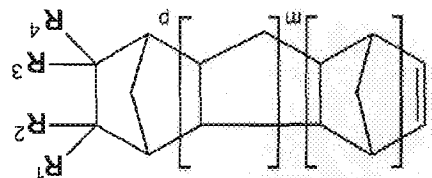
[Means for Solving the Problem] This invention (A) cyclic olefin system thermoplastics, Or an injection-molding object in which a detailed pattern in which (A) cyclic olefin system thermoplastics and (B) polystyrene equivalent average molecular weight fabricate a thermoplastic resin composition which consists of solid hydrocarbon resin at ordinary temperature or less by 2000 was transferred with high degree of accuracy is provided. This invention provides the above-mentioned injection-molding object, wherein above-mentioned (A) cyclic olefin system thermoplastics contains one or more kinds of polar groups.

[0005]

[Embodiment of the invention] Hereafter, the thermoplastic resin composition of this invention is explained in detail.

< -- (A) ingredient: which constitutes the resin composition of cyclic olefin system thermoplastics > this invention -- as cyclic olefin system thermoplastics (it is described as the (A) ingredient below), the polymer shown in the following \*\* - \*\* can be mentioned. \*\* ring breakage copolymer [ of the ring-opening-polymerization object \*\* specific monomer of a monomer (henceforth a "specific monomer") and copolymeric monomer which are expressed with following general formula (I) ] \*\* -- hydrogenation polymer [ of said ring breakage (\*\*) polymer ] \*\* , after cyclizing said ring breakage (\*\*) polymer by the Friedel craft reaction, The saturation copolymer of the polymer (\*\*) \*\* specific monomer and unsaturated double bond content compound which were hydrogenated [0006]

[Formula 1]



[0007] Among the formula,  $R^1 - R^4$  are a hydrogen atom, a halogen atom, a hydrocarbon group of the carbon numbers 1-10, or other univalent organic groups, respectively, may be the same respectively or may differ. it may unify and  $R^1, R^2$  or  $R^3$ , and  $R^4$  may form a divalent hydrocarbon group -- it may combine with each other and  $R^1$  or  $R^2, R^3$ , or  $R^4$  may form a monocycle or polycyclic structure. m is 0 or a positive integer and p is 0 or a positive integer. ] Cyclic polyolefin system resin obtained from the above-mentioned specific monomer As for [(A) ingredient], it is preferred to contain one or more kinds of polar groups in molecular structure from a viewpoint of raising the processability of injection molding.



[0008]<Specific monomer> as a desirable specific monomer,  $R^1$  and  $R^3$  are the hydrocarbon groups of a hydrogen atom or the carbon numbers 1-10 among the above-mentioned general formula (I),  $R^2$  and  $R^4$  are the organic groups of a hydrogen atom or monovalence, At least one of  $R^2$  and the  $R^4$  shows polar groups other than a hydrogen atom and a hydrocarbon group,  $m$  is an integer of 0-3,  $p$  is an integer of 0-3, and it can mention that whose  $m+p$  is 0-4 (still more preferably 0-2, especially preferably 1). A specific monomer which has a polar group expressed with formula-(CH<sub>2</sub>)<sup>n</sup> COOR<sup>5</sup> among specific monomers has a preferred

thermoplastic resin composition obtained at a point used as a high glass transition temperature and a thing which has low hygroscopicity. in the above-mentioned formula concerning a polar group --  $R^5$  -- a hydrocarbon group with 1-12 carbon atoms -- it is an alkyl group preferably. Although  $n$  is usually 0-5, since glass transition temperature of a thermoplastic resin composition in which a thing which has a small value of  $n$  is obtained becomes high, it is desirable, and the composition of a specific monomer whose  $n$  is 0 further is preferred at an easy point. in the above-mentioned general formula (I), it is preferred that  $R^1$  or  $R^3$  is an alkyl group, and carbon numbers of the alkyl group concerned are 1-4 -- desirable -- further -- desirable -- 1-2 -- it is 1 especially preferably. It is preferred to be combined with the same carbon atom as a carbon atom which a polar group especially expressed with formula-(CH<sub>2</sub>)<sup>n</sup> COOR<sup>5</sup> of the above [ this alkyl group ] combined. in general formula (I), a specific monomer whose  $m$  is 1 is preferred at a point that a thermoplastic resin composition with a high glass transition temperature is obtained.

[0009]The following compounds are mentioned as an example of a specific monomer expressed with the above-mentioned general formula (I). Bicyclo[2.2.1]hept 2-ene, 5.2.1.0<sup>2</sup>-tricyclo[6<sup>1</sup>]-8-decene, Tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, Pentacyclo [6.5.1.1<sup>3</sup>.6<sup>0</sup>.2<sup>7</sup>.0<sup>9</sup>.1<sup>3</sup>]-4-pentadecene, Pentacyclo [7.4.0.1<sup>2</sup>.5<sup>1</sup>.9<sup>12</sup>.0<sup>8</sup>.1<sup>3</sup>]-3-pentadecene, Tricyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.3<sup>13</sup>]-undecene, 5-methylbicyclo[2.2.1]hept 2-ene, 5-ethylbicyclo[2.2.1]hept 2-ene, 5-carbomethoxybicyclo[2.2.1]hept 2-ene, 5-cyanobicyclo[2.2.1]hept 2-ene, 8-carbomethoxy tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, 8-ethoxybicyclo[2.2.1]hept 2-ene, 8-isopropoxycarbonyl tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, 8-n-butoxycarbonyl tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, 8-methyl-8-n-butoxycarbonyl tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, 8-methyl-8-n-carbopropoxy tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, 8-methyl-8-isopropoxycarbonyl tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, 8-methyl-8-ethoxycarbonyl tetracyclo [4.4.0.1<sup>2</sup>.5<sup>1</sup>.7<sup>10</sup>]-3-dodecen, 8-methyl-8-n-butoxycarbonyl

tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, Dimethano octahydronaphthalene, ethyltetracyclo dodecen, 6-ethylidene-2-tetracyclo dodecen, trimethano octahydronaphthalene, pentacyclo [8.4.0.1<sup>2,5</sup>.1<sup>9,12</sup>.0<sup>8,13</sup>]-3-hexa decene, Heptacyclo [8.7.0.1<sup>3,6</sup>.1<sup>10,17</sup>.1<sup>12,15</sup>.0<sup>2,7</sup>.0<sup>11,16</sup>]-4-eicosen, Heptacyclo [8.8.0.1<sup>4,7</sup>.1<sup>11,18</sup>.1<sup>13,16</sup>.0<sup>3,8</sup>.0<sup>12,17</sup>]-5-strange eicosen, 5-ethylidenebicyclo[2.2.1]hept 2-ene, 8-ethylidene tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 5-phenylbicyclo[2.2.1]hept 2-ene, 8-phenyl tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 5-fluorobicyclo[2.2.1]hept 2-ene, 5-fluoromethylbicyclo[2.2.1]hept 2-ene, 5-pentafluorobicyclo[2.2.1]hept 2-ene, 5,5-difluorobicyclo[2.2.1]hept 2-ene, 5,5-bis(trifluoromethyl)bicyclo[2.2.1]hept 2-ene, 5,5,6-trifluorobicyclo[2.2.1]hept 2-ene, 5,5,6-tris(fluoromethyl) bicyclo[2.2.1]hept 2-ene, 5,5,6-bis(trifluoromethyl)bicyclo[2.2.1]hept 2-ene, 5,5,6-tetrakis (trifluoromethyl) bicyclo[2.2.1]hept 2-ene, 5,5,6-difluoro-6,6-bis(trifluoromethyl)bicyclo[2.2.1]hept 2-ene, 5,5,6-trifluoro-5,6-bis(trifluoromethyl) bicyclo[2.2.1]hept 2-ene, 5,5,6-trifluoro-5,6-bis(trifluoromethyl) bicyclo[2.2.1]hept 2-ene, 5,6-dichloro-5,6-bis(trifluoromethyl)bicyclo[2.2.1]hept 2-ene, 5,5,6-trifluoro-6-trifluoro methoxy bicyclo[2.2.1]hept 2-ene, 5,5,6-trifluoro-6-heptafluoro propoxybicyclo[2.2.1]hept 2-ene, 8-fluoro tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8-fluoro methyltetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8-difluoroethyl tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8-difluoromethyl tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8-pentafluoro ethyltetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8-difluoro tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8-bis(trifluoromethyl)tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8-methyl-8-trifluoromethyl tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8,9-trifluoro tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8-difluoro-9,9-bis(trifluoromethyl)tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8,9-trifluoro-9-difluoro-8,9-bis(trifluoromethyl)tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8,9-trifluoro-9-trifluoromethyl tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8,9-trifluoro methoxy tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,8,9-trifluoro-9-pentafluoro propoxy tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8-fluoro-8-pentafluoroethyl 9,9-bis(trifluoromethyl)tetracyclo [4.4.0.1<sup>2,5</sup>.1<sup>7,10</sup>]-3-dodecen, 8,9-difluoro-8-heptafluoro iso-propyl-9-trifluoromethyl tetracyclo

[4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen, 8-chloro-8,9-trifluoro tetraacyclo [4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen, 8,9-dichloro-8,9-bis(trifluoromethyl)tetraacyclo [4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen, 8-(2,2,2-trifluoroethoxycarbonyl) tetraacyclo [4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen, 8-methyl-8-(2,2,2-trifluoroethoxycarbonyl) tetraacyclo [4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen etc. can be mentioned.

[0010] 8-methyl-8-carbomethoxy tetraacyclo among these specific monomers [4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen, 8-ethylidene tetraacyclo [4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen, pentacyclo [7.4.0.1<sup>2,5</sup>,1<sup>9,12</sup>,0<sup>8,13</sup>] At a point that a thermoplastic resin composition obtained eventually becomes the thing excellent in heat resistance, it is desirable and-3-pentadecene is 8-methyl-8-carbomethoxy tetraacyclo especially. [4.4.0.1<sup>2,5</sup>,1<sup>7,10</sup>]-3-dodecen is preferred from cyclic polyolefin system resin excellent in compatibility with the (B) ingredient being obtained.

[0011] In a ring-opening-polymerization process for obtaining a <copolymeric monomer (A)> ingredient, although ring opening polymerization of the above-mentioned specific monomer may be carried out independently, ring breakage copolymerization of specific monomer concerned and a copolymeric monomer may be carried out. In this case, as an example of a copolymeric monomer used, Cycloolefins, such as cyclobutene, cyclopentene, cyclohepten, cyclooctane, 5.2.1.0<sup>2</sup> and tricyclo [6]-3-decene, 5-ethylidene-2-norbornene, and a dicyclopentadiene, can be mentioned. As a carbon number of cycloolefin, 4-20 are 5-12 desirable still more preferably. Ring opening polymerization of the specific monomer may be carried out under existence of unsaturation hydrocarbon system polymer etc. which include a double bond between carbon-carbon in main chains, such as polybutadiene, polyisoprene, a styrene butadiene copolymer, an ethylene-non-conjugated diene copolymer, and poly norbornene. And a hydrogenation thing of a ring-opening-polymerization object acquired in this case is useful as a raw material of shock-proof large resin.

[0012] In <ring opening polymerization catalyst> this invention, a ring-opening-polymerization reaction is performed under existence of a metathesis catalyst. At least one sort as which this metathesis catalyst was chosen from a compound of (a) W, Mo, and Re, (b) Deming's periodic table IA group element (for example, Li, Na, K, etc.), IIA group elements (for example, Mg, Ca, etc.) and an IIB group element (for example, Zn, II B group elements (for example, B, aluminum, etc.), such as Cd and Hg, and an IVA group element (for example, Ti, Zr etc. are the compounds of IVB group elements (for example, Si, Sn, Pb, etc.), and it is a catalyst which consists of at least one sort chosen from what has at least one element-carbon to carbon bond concerned or the element-hydrogen bond concerned of combination. In order to improve the activity of a catalyst in this case, the below-mentioned additive agent (c) may be added.

[0013] (a) As an example of representation of a compound of W suitable as an ingredient, Mo,

or Re, a compound of a statement can be mentioned to JP, 1-240517, A, such as  $WCl_6$ ,  $MoCl_5$ , and  $ReOCl_3$ . As an example of an ingredient, (b)  $n-C_4H_9Li$ ,  $(C_2H_5)_3aluminum$ ,  $(C_2H_5)_2AlCl$ ,  $(C_2H_5)_2AlCl$ ,  $(C_2H_5)_2$ , methylalumoxane, and  $LiH$ . As an example of representation of the (c) ingredient which is an additive agent, although alcohols, aldehyde, ketone, amines, etc. can use

conveniently, a compound shown in JP, 1-240517, A can be used.

[0014] Let "(a) ingredient:specific monomers" be a range usually set to 1:500-1:50000, and a range preferably set to 1:1000-1:10000 by a mole ratio of the above-mentioned (a) ingredient and a specific monomer as amount of metathesis catalyst used. (a) a rate of an ingredient and the (b) ingredient -- a metal atom ratio -- "(a) : (b)" -- 1:1-1:50 -- it is preferably considered as the range of 1:2-1:30. (a) a rate of an ingredient and the (c) ingredient -- a mole ratio -- "(c) : (a)" -- 0.005:1-15:1 -- it is preferably considered as the range of 0.05:1-7:1.

[0015] Although polymerization temperature, a kind of catalyst, and a kind of solvent can also perform regulation of a molecular weight of a <molecular weight modifier> ring-opening-polymerization object, in this invention, it is preferred to adjust by making a molecular weight modifier live together in the system of reaction. As a molecular weight modifier suitable here, for example Ethylene, a propene, Alpha olefins and styrene, such as 1-butene, 1-pentene, 1-hexene, 1-heptene, 1-octene, 1-nonene, and 1-decene, can be mentioned, and 1-butene and especially 1-hexene are [among these] preferred. these molecular weight modifiers are independent -- it is -- two or more sorts can be mixed and used. As amount of molecular weight modifier used, 0.005-0.6 mol shall be 0.02-0.5 mol preferably to 1 mol of specific monomers with which a ring-opening-polymerization reaction is presented.

[0016] As a solvent (solvent which dissolves a specific monomer, a metathesis catalyst, and a molecular weight modifier) used in a <solvent for ring-opening-polymerization reaction> ring-opening-polymerization reaction, For example, alkanes, such as pentane, hexane, heptane, octane, nonane, and Decan; Cyclohexane, Cycloalkanes, such as cycloheptane, cyclooctane, a decalin, and norbornane; Benzene, Aromatic hydrocarbon, such as toluene, xylene, ethylbenzene, and a cumene; Chlorobutane, Bromine hexane, a methylene chloride, a dichloroethane, hexamethylenedibromide, Compounds, such as halogenated alkane; aryls, such as chlorobenzene, chloroform, and tetrachloroethylene; Ethyl acetate, Saturated-carboxylic-acid ester species, such as n-butyl acetate, acetic acid iso-butyl, methyl propionate, and dimethoxyethane; ether, a tetrahydrofuran, and dimethoxyethane, can be mentioned, and these are independent, or can be mixed and used. Aromatic hydrocarbon is [among these] preferred. As amount of solvent used, "a solvent:specific monomer (weight ratio)" is made into quantity usually set to 1:1-10:1, and let it be the quantity preferably set to 1:1-5:1.

[0017]<Catalysts for hydrogenation> Although a ring breakage (\*\*) polymer produced by making it above can also be used as a (A) ingredient as it is, it is preferred to use a hydrogenation (\*\*) polymer by which hydrogenation was carried out as a (A) ingredient. a hydrogenation reaction adds catalysts for hydrogenation to a usual method, i.e., a solution of a ring breakage (\*\*) polymer, -- this -- ordinary pressure - 300 atmospheres is performed by making 0-200 \*\* of 3-200-atmosphere hydrogen gas act at 20-180 \*\* preferably. As catalysts for hydrogenation, what is used for a hydrogenation reaction of the usual olefin nature compound can be used. As these catalysts for hydrogenation, a heterogeneous catalyst and a homogeneous catalyst are publicly known. As a heterogeneous catalyst, a solid catalyst which made carriers, such as carbon, silica, alumina, and a titania, support precious metal catalyst substances, such as palladium, platinum, nickel, rhodium, and a ruthenium, can be mentioned. As a homogeneous catalyst, naphthenic acid nickel / triethylaluminum, Nickel acetylacetonato / triethylaluminum, octenato cobalt / n-butyl lithium, Titanocene dichloride / diethylaluminum monochloride, acetic acid rhodium, Chlorotris(triphenyl phosphine) rhodium, a dichlorotris(triphenyl phosphine) ruthenium, A chlorohydroxycarbonyltris(triphenyl phosphine) (triphenyl phosphine), a dichlorocarbonyltris(triphenyl phosphine) ruthenium, etc. can be mentioned. Powder of a gestalt of a catalyst may also be granular. These catalysts for hydrogenation are used at a rate that "ring breakage (\*\*) polymer:catalysts for hydrogenation (weight ratio)" is set to  $1:1 \times 10^{-6}$  -  $1:2$ . Thus, by hydrogenating, a hydrogenation (\*\*) polymer obtained becomes what has the outstanding thermal stability, and the characteristic does not deteriorate depending on heating at the time of a fabricating operation and use as a product. A hydrogenation rate is not less than 50% of usually not less than 90% still more preferably not less than 70% preferably here.

[0018]In order to obtain the (A) ingredient which consists of a <unsaturated double bond content compound which constitutes saturation copolymer> saturation copolymer, as an unsaturated double bond content compound with which a copolymerization reaction with a specific monomer is presented, for example, the carbon numbers 2-12, such as ethylene, propylene, and a butene, -- an olefinic compound of 2-8 can be mentioned preferably.

[0019]As a catalyst used for a copolymerization reaction of a <catalyst used when obtaining saturation copolymer> specific monomer, and an unsaturated double bond content compound, a catalyst which consists of a vanadium compound and an organoaluminum compound is used. As a vanadium compound, general formula  $VO(OR)^a X^b$  or  $V(OR)^c X^d$ . ( -- however -- R -- a hydrocarbon group -- zero -- < -- a -- < -- three -- zero -- < -- b -- < -- three -- two -- < -- a+b -- < -- three -- zero -- < -- c -- < -- four -- zero -- < -- d -- < -- four -- three -- < -- c+d -- < -- four --) -- expressing -- having -- a vanadium compound -- or -- these -- an electron donor -- an addition -- using -- having. As an electron donor, alcohol, phenols, ketone, aldehyde, Nitrogen-containing electron donors, such as oxygenated electron donors, such as

ester of carboxylic acid, organic acid, or inorganic acid, ether, an acid amide, an acid anhydride, and alkoxysilane, ammonia, amine, nitril, and isocyanate, etc. are mentioned. At least one sort chosen from what has at least one aluminum carbon combination or an aluminum hydrogen bond as an organoaluminum compound catalyst component is used. a ratio [ as opposed to a vanadium atom in a ratio of a catalyst component ] (aluminum/V) of aluminum atoms -- two or more -- desirable -- 2-50 -- it is the range of 3-20 especially preferably.

[0020]As a solvent used for a copolymerization reaction of a <solvent used when obtaining saturation copolymer> specific monomer, and an unsaturated double bond content compound, For example, alkanes, such as pentane, hexane, heptane, octane, nonane, and Decan. Aromatic hydrocarbon, such as cycloalkanes, such as cyclohexane and a methylcyclohexane, benzene, toluene, and a halogen derivative of those can be mentioned, and cyclohexane is [ among these ] preferred.

[0021]As for intrinsic viscosity (eta<sub>inh</sub>) measured in the 30 \*\* chloroform of the (A) ingredient used by this invention, it is preferred that it is 0.2 - 5.0 dl/g. As a molecular weight of the (A) ingredient, a thing of the range of 20,000-300,000 is preferred for 8,000-100,000, and weight average molecular weight (Mw) for a number average molecular weight (Mn) of polystyrene conversion measured with gel permeation chromatography (GPC).

[0022]With a specific cyclic olefin system thermoplastic resin composition used for <specific cyclic olefin system thermoplastic resin composition> this invention, For example, it is a thermoplastic resin composition containing specific hydrocarbon resin indicated in JP,9-221577,A and a JP,10-287732,A gazette, and is adding to <(A ingredients) >, <(B ingredient): hydrocarbon resin> of a statement is included in the following, and it is \*\*. Such a thermoplastic resin composition has good balance of heat resistance and molding workability. [0023]as hydrocarbon resin of <(B) ingredient> this invention, a polystyrene equivalent weight average molecular weight is a thing of 100-20000 preferably 20000 or less -- further --

desirable -- 200-10000 -- it is a thing of 300-5000 especially preferably. It is a solid thing at ordinary temperature. as an example -- C5 resin, C9 resin, and C5 system / C9 system -- mixed resin and cyclopentadiene system resin. A hydrogenation thing of polymer system resin of a vinyl substitution aromatic system compound, copolymer system resin of an olefin/vinyl substituted aromatic compound, copolymer system resin of a cyclopentadiene system compound / vinyl substitution aromatic system compound, or said resin, etc. can be mentioned. inside of these -- C5 resin, C9 resin, and C5 system / C -- mixed resin, cyclopentadiene system resin, polymer system resin of a vinyl substitution aromatic system compound, and these mixtures are mentioned 9 system. As C5 resin, an aliphatic series system is preferred, and an alicycle follows system is preferred as C9 resin. Especially as for a desirable thing, C9 resin, cyclopentadiene system resin, and these mixtures are mentioned in



these.

[0024] If a polystyrene equivalent weight average molecular weight of these hydrocarbon system resin is too high, since compatibility with thermoplastic thermoplasticity norbornene system resin which has a polar group will worsen and transparency will decrease, it is not desirable. If a liquefied hydrocarbon compound is used at ordinary temperature, since it will be easy to reduce intensity of resin and bleeding will moreover be carried out on the surface of resin, it is not desirable. A blending ratio of hydrocarbon resin is five to 45 weight section especially preferably two to 50 weight section still more preferably one to 60 weight section preferably [0.1 to 100 weight section] to thermoplastic norbornene system resin 100 weight section. A combination method of a thermoplastic resin composition used for this invention, blending and pelletizing hydrocarbon system resin in a publicly known device used for processing of thermoplastics, for example, a twin screw extruder, a single screw extruder, a continuation kneader, a roll kneading machine, a pressurized kneader, a Banbury mixer, and a solution of norbornene system resin etc. is mentioned.

[0025] In cyclic olefin system thermoplastics or a specific cyclic olefin system thermoplastic resin composition used for an injection-molding object of this invention. Publicly known thermoplastics, thermoplastic elastomer, a gum polymer, organic particulates, inorganic particles, etc. may be blended in the range which furthermore does not spoil transparency and the heat resistance of a constituent.

[0026] An antioxidant publicly known to a resin composition of this invention, for example, 2,6-di-tert-butyl-4-methylphenol, The 2,2'-di-oxo 3,3'-di-tert-butyl-5, a 5'-dimethylid phenylmethane, Tetrakis [methylene-3-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate] methane; it can stabilize by adding an ultraviolet ray absorbent, for example, 2,4-dihydroxybenzophenone, 2-hydroxy-4-methoxybenzophenone, etc. Additive agents, such as lubricant, can also be added in order to raise processability.

[0027] As cyclic olefin system thermoplastics used for this invention, and a specific cyclic olefin system thermoplastic resin composition, 110-200 ° of glass transition temperature (T<sub>g</sub>) is still more preferably preferred for a 115-180 ° thing in respect of heat resistance and molding workability preferably. In 260 °, melt viscosity The melt viscosity  $\eta_1$  at the time of the shear rate 10 (rad/s), ratios ( $\eta_1/\eta_2$ ) with the melt viscosity  $\eta_2$  at the time of the shear rate 10000 (rad/s) are 50-500 -- desirable -- further -- desirable -- it is 150-400 especially preferably. The transfer nature of a pattern is excellent in it being this within the limits.

[0028] The injection-molding object of this invention can perform fabricating processing to the surface by a publicly known method. By methods, such as PVD and CVD, vapor-deposit an inorganic substance on the surface which performs curing treatment for the surface by an electron beam, ultraviolet rays, etc., and on it For example, acid resisting, An organic compound is applied to the surface which gives functions, such as corrosion resistance and



damage resistance, Applying a paint containing paints or a color which laminates a resin sheet or a film containing cyclic olefin system thermoplastics which gives functions, such as acid resisting, corrosion resistance, and damage resistance, and which laminates a metal thin film etc. is mentioned. When laminating a film sheet, a publicly known surface treatment may be performed to the surface.

[0029] Shape in particular of a Plastic solid of this invention is not limited. As an example of shape, circular or a plate of polygonal shape, a wedge, rod form, a hollow circle, prism, a lens, the shape of a bucket, etc. are mentioned. Shape in particular of a detailed pattern is not limited, either. For example, a slot (a concave, a convex shape, a V type, a semicircle type, a trapezoid type, a prism type) of parallel or the shape of a lattice is 1 or two or more shape to a molded body surface. Multiple pillars, such as many pyramids, such as a hemisphere, a triangular pyramid, and a pyramid, a cone, a rectangular parallelepiped, a pillar, a triangular prism, and a square pole, etc. are the shape of a lattice, or the shape by which multiple arrays were carried out alternately. Shape etc. to which marking, such as a circle, a cross joint, a polygon, and the Kakumaru polygon, was performed are mentioned to a molded body surface. An example of a detailed pattern was shown in drawing 1 - 10.

[0030] Although a size in particular of a detailed pattern is not limited, it is possible to make that the depth and whose width are 0.01-1000 micrometers preferably transfer, and 0.01-500 micrometers of things [ further 0.01-100 micrometers of ] made to transfer a 0.01-50-micrometer thing are especially suitably possible. As a detailed pattern, when forming two or more patterns, distance between patterns in particular is not limited, but 1000-0.02 micrometer of 100-0.05-micrometer things [ 500-0.02 micrometer of / 200-0.02 micrometer of ] can be applied especially preferably still more preferably, for example.

[0031] A Plastic solid of this invention is fabricated by injection molding. Form in particular of an injection molding machine is not limited. For example, a method etc. with which an oil pressure controller, an electric servo system, and these combined are held as a direct pressure type, a toggle type, and a drive system as an in-line type, a PURIPURA type, and a mold clamp method as the cylinder mode. Although a detailed pattern is given by metallic mold, a metallic mold is usually manufactured with publicly known steel materials. The surface treatment may be carried out to a cavity side by a publicly known method. A detailed pattern of a metallic mold is formed by methods, such as publicly known cutting, etching, and electrocasting. A detailed pattern may be formed in the movable side [ of a metallic mold ], fixed side, or both sides side, and structure accompanied by flexible regions, such as a slide core, may be sufficient as it.

[0032] Publicly known methods, such as what put in a diaphragm, can be used for gate shape in the middle of straight shape, a pin gate, a fan gate, a film gate, a tunnel gate, and a gate. Publicly known methods, such as a broth with pin ejection and a field, can be used for ejection

of mold goods. As a medium for temperature control of a metallic mold, usual water or straight mineral oil etc. can be used. Deseccation of resin before shaping is usually performed by a publicly known hot wind type, a dehumidification type, or vacuum type at 80 °C - 120 °C for 4 to 6 hours. A device which makes a plasticization part a vacuum from a viewpoint of prevention, such as hue improvement or a glow of mold goods, like [hopper area] enclosure of inactive gas, such as nitrogen and argon, for example, "ALFIN" currently marketed from Sumitomo Heavy Industries, Ltd., may be used. Although a process condition in particular is not specified, it is usually preferred that a cylinder temperature fabricates 260 °C - 300 °C, and a die temperature in the range of glass-transition-temperature Tg-1 °C - Tg-20 °C of cyclic olefin system resin or a specific cyclic olefin system resin composition.

[0033] It can be used for various optical materials which need detailed pattern processing for the surface, such as prism, a lens, a plane lens, a diffraction grating, a light guide plate of an LCD device, a diffusion board, and various light guides, using an injection-molding object of this invention.

[0034]

[Example] Hereafter, this invention is not restricted by these although the example of this invention is described. A "part" shows a "weight section" below.

[0035] The list of A ingredients used for the front light guide plate of A ingredient this invention was shown in table-1. The synthesizing method of an ingredient is illustrated as preparation of A ingredient (A-1). The following (A-2) was manufactured according to (A-1).

[0036]

[Table 1]

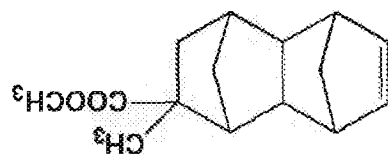
		モ/マ-1	モ/マ-2	$\eta$ (inch)	$T$ (°C)
(A-1)	種類	8-メチル-8-メチル シカルボニルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	250	0.50	165
	部数	250			
(A-2)	種類	8-メチル-8-メチル シカルボニルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	250	0.62	168
	部数	250			
(A-3)	種類	8-エチルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	200	0.50	142
	部数	200			
(A-4)	種類	8-エチルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	200	0.62	145
	部数	200			
(A-5)	種類	8-メチル-8-メチル シカルボニルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	225	0.50	141
	部数	225			
(A-6)	種類	8-メチル-8-メチル シカルボニルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	225	0.56	143
	部数	225			
(A-7)	種類	8-メチル-8-メチル シカルボニルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	217	0.50	141
	部数	217			
(A-8)	種類	8-メチル-8-メチル シカルボニルチラジ シロ[4.4.0.1 <sup>25</sup> .1 7.10]-3-エチル	217	0.56	142
	部数	217			

[0037](A-1) 250 copies of 8-methyl-8-carbomethoxy tetracyclo [4.4.0.1<sup>2</sup>,<sup>5</sup>,1<sup>7</sup>,1<sup>10</sup>]-3-dodecen (specific monomer) expressed with the adjustment method following formula (1) of an

ingredient, it taught in 41 copies of 1-hexenes (molecular weight modifier), and the reaction vessel which carried out the nitrogen purge of 750 copies of toluene (solvent for a ring opening-polymerization reaction), and this solution was heated at 60 \*\*. In the solution in a reaction vessel, subsequently, 0.62 copy of toluene solution (1.5 mol/(l.)) of triethylaluminum, 3.7 copies of toluene solutions (concentration of 0.05 mol/l.) of hexachloride tongue ZUTEN (methanol: t-butanol : tungsten = 0.35 mol : 0.3 mol : 1 mol) which denaturalized with t-butanol / methanol are added, By carrying out heating stirring of this system at 80 \*\* for 3 hours, the ring-opening-polymerization reaction was carried out and the ring-opening-polymerization object solution was obtained. The polymerization conversion in this polymerization reaction was 97%.

[0038]

[Formula 2]



[0039] Thus, 4000 copies of obtained ring-opening-polymerization object solutions are taught to autoclave, 0.48 copy of  $\text{RuHCl}(\text{CO})[\text{P}(\text{C}_6\text{H}_5)_3]_3$  was added in this ring-opening-polymerization object solution, and the hydrogenation reaction was carried out to it by carrying out heating stirring for 3 hours under hydrogen-gas-pressure  $100 \text{ kg/cm}^2$  and conditions with a reaction temperature of  $165^\circ\text{C}$ . Pressure was discharged into hydrogen gas after cooling the obtained reaction solution (hydrogenation polymer solution). Thus, the hydrogenation rate of the obtained hydrogenation polymer (henceforth an ingredient (A-1)) is 100% on parenchyma. [0040]

[B ingredient] (B-1) ingredient cyclopentadiene vinylaromatic system petroleum resin. the molecular weight 1130 and  $125^\circ\text{C}$  (B-2) of softening temperature ingredient vinylaromatic system petroleum resin The molecular weight 2440 and  $140^\circ\text{C}$  (B-3) of softening temperature ingredient C9-dicyclopentadiene system petroleum resin the molecular weight 818 and  $125^\circ\text{C}$  (B-4) of softening temperature ingredient hydrogenation C9 system -- petroleum resin. The molecular weight 1590, the other resin [ softening temperature  $100^\circ\text{C}$  and ] methacrylic-resin: specific gravity 1.19, Tg  $108^\circ\text{C}$ , MFR(260  $^\circ\text{C}$ , 10 kg) 154 polycarbonate resin: The specific gravity 1.20, Tg  $146^\circ\text{C}$ , MFR(260  $^\circ\text{C}$ , 10 kg) 34 [0041] After addition / dissolution, B ingredient of the specified quantity was corned to it, after isolating coagulation and polymer with a lot of polymer solutions in the polymerization solution of the preparation A ingredient of a thermoplastic resin composition, and the pellet was obtained. The viscosity ratio of polymer. With a corn plate form rheometer, the relation of the shear-rate-melt viscosity at  $260^\circ\text{C}$ , it analyzed based on the publicly known rheology model (cross model), and asked for the melt viscosity  $\eta_1$  of the shear rate 10 (rad/s), and the melt viscosity  $\eta_2$  of the shear rate 10000 (rad/s), and the viscosity ratios  $\eta_1/\eta_2$  were computed. The viscosity ratios  $\eta_1/\eta_2$  of the polymer used for the example and the comparative example or a constituent were shown in table-2. [0042]

[Table 2]

	$\eta_1/\eta_2$
(A-1)	260
(A-3)	220
(A-5)	230
(A-7)	250
メタクリル樹脂	100
ポリカーボネート樹脂	40
組	(A-2)(B-1)=100:35
成	(A-4)(B-2)=100:20
物	(A-6)(B-3)=100:20
	(A-8)(B-4)=100:20
	(A-10)(B-4)=100:20
	300

[0043]Shape of mold goods:

- It is shape-1100mmx100mm and a 1-mm-thick plate, and parallel width, a depth of 0.5 micrometer, and the pattern of 5 micrometers x 100 intervals were formed by the concave. - It is shape-2100mmx100mm and a 1-mm-thick plate, and 100 prism 250 micrometers in width and 10 micrometers in depth was formed.

- It is shape-3100mmx100mm and a 1-mm-thick plate, and a hemispherical dot 15 micrometers in radius formed in the shape of [ 100x100 ] a lattice at intervals of 100 micrometers.

- It is shape-43mmx3mm and rod form 60 mm in length, and the V groove with a 10-micrometer15-micrometer length [ in height ] of 3 mm formed 100 in convex at intervals of 500 micrometers oneth of them. [ in width ]

- Shape-51 piece length formed a mark 1 micrometer in width, a depth of 1 micrometer, and 15 micrometers in diameter in the field used as the square of the prism of the piece trianglepole shape of right-angle 2 grade which is 15 mm and 15 mm in height.

[0044]The sample used by the examination of the forming process following of a specimen was performed in injection molding. A making machine is product Sgmade from Sumitomo heavy industrial machine75M-2. Process conditions are the resin temperature of 260-300 \*\*, and a die temperature of 80-140 \*\*.

[0045]According to the meaning of this invention, it examined about the following item.

\* transfer nature -- detailed transfer nature was measured with the minute shape measuring instrument, and it evaluated according to shape as following.

- The straight part transfer nature of a shape-1O-depth direction. The straight part transfer nature of a not less than 95%O-depth direction. The straight part transfer nature of 70% - an 85%-x-depth direction. The 95%\*\*-depth direction. The straight part transfer nature by the side of less than 70% and a shape-2O-straight part shorter side. The transfer nature by the side of a not less than 90%O-straight part shorter side. The transfer nature by the side of an 80 to 90%\*\*-straight part shorter side. The transfer nature by the side of a 70 to 80%-x-straight part shorter side. In the longest diameter part of less than 70% and a

shape-30-hemispherical dot. The deviation from circular form which can be set. In the longest diameter part of a not less than 98%O-hemispherical dot. The deviation from circular form which can be set. In the longest diameter part of a 95 to 98%\*\*-hemispherical dot. The deviation from circular form which can be set. In the longest diameter part of an 85 to 95% deviation from circular form which can be set. In the longest diameter part of an average of hemispherical dot. The transfer nature of an average of the transfer nature of an average of the transfer nature of an average of an average of the deviation from circular form which can be set of less than 85% and shape-40-V groove both sides of not less than 90%O-V groove both sides of 80 to 90%\*\*-V groove both sides of 70 to 80%x-V groove both sides does not have a gap of less than 70% and a shape-50-mark, and is fully transferred.

A gap is seen at a part of \*-mark.

The multiple transfer of x-mark is seen.

[0046] endurance -- the following two kinds of examinations were done and the pattern shape after an examination was evaluated.

- The shape of the sample after a 500-hour shelf test was evaluated according to each above-mentioned valuation basis in heat-resistant gear oven, 100\*\*x 500-hour neglect and moisture-proof heat elevated-temperature constant humidity chamber, and 85\*\*x85RH%.

[0047]The presentation shown in Examples 1-24, comparative example 1 - 10 table-3 - table-5 performed the quality assessment of the injection-molding object. Since the injection-molding object of this invention excels these comparison in heat resistance and resistance to moist

heat while it is excellent in the transfer nature of a pattern with a detailed molded body surface, it turns out that pattern shape does not change under the environment of actual use.

[0048]

[Table 3]

成分	1	2	3	4	5	6	7	8	9	10	11	12
A成分	100	100	100	100	100	100	100	100	100	100	100	100
A-1												
A-2												
A-3												
A-4												
A-5												
A-6												
A-7												
A-8												
B成分												
B-1												
B-2												
B-3												
B-4												
その他成分												
メタクリル樹脂												
ポリカーボネート樹脂												
成形品形状	1	2	3	4	5	1	1	2	3	4	5	1
転写性	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
耐水性	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
耐熱性	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎

JP, 2001-323074, A [DETAILED DESCRIPTION]

Table 4]

[0050]

[Table 5]

[Table 5]

10051

[Effect of the invention]The thermoplastic resin composition of this invention can provide the

[0052]

system resin has.



[Translation done.]